

Claims

1. A method (300) of determining per-cell traffic coverage in a cellular communication system that comprises multiple cells, the method characterised by the steps of:
  - receiving measurements of one or more parameters relating to one or more operations of a first cell in a cellular communication system, wherein said one or more parameters includes information relating to whether a wireless subscriber communication unit can be served by a number of cells or uniquely served by the first cell; and
  - calculating (310, 315) a degree of coverage overlap for said first cell based on a number of said measurements, wherein said measurements are partitioned (310) into one or more of at least three categories with respect to the first cell, wherein:
    - (i) A first category is where the measurement indicates a wireless subscriber unit that is uniquely served by the first cell,
    - (ii) A second category where the measurement indicates a wireless subscriber unit that can be served by a number of cells, and
    - (iii) A third category where the measurement indicates a wireless subscriber unit that is served by a neighbouring cell but could be served by the first cell.
2. The method (300) of determining per-cell traffic coverage in a cellular communication system according to Claim 1, wherein the step of calculating (310, 315) a degree of coverage overlap based on a number of said

measurements employs a statistically valid sample of said measurements.

3. The method (300) of determining per-cell traffic  
5 coverage in a cellular communication system according to  
any preceding Claim, wherein the step of calculating  
(310, 315) comprises determining an unique coverage  
factor (UCF) for that cell, where:

10 
$$UCF = \frac{\text{Sum of MRs with no and/or weak neighbours}}{\text{Total Sum of MRs}}$$

4. The method (300) of determining per-cell traffic  
coverage in a cellular communication system according to  
15 any preceding Claim, the method further characterised by  
the step of:

converting (315) a number of measurements to  
Erlangs to determine a coverage overlap based on  
subscriber traffic within said cell.

20 5. The method (300) of determining per-cell traffic  
coverage in a cellular communication system according to  
any preceding Claim, the method further characterised by  
the step of:

25 allocating a priority, for example an alarm  
priority, to said cell based on said calculation.

6. The method (300) of determining per-cell traffic  
coverage in a cellular communication system according to  
30 any preceding Claim, the method further characterised by  
the step of:

re-configuring (335) an operational parameter of  
said cell, for example a transmit power, a beam-forming

antenna tilt or direction, or turning off a cell, in response to said calculation.

7. The method (300) of determining per-cell traffic coverage in a cellular communication system according to any preceding Claim, the method further characterised by the steps of:

5       storing said calculations; and  
10      using (330) said stored calculation subsequently  
10      to determine a cell outage strategy.

8. The method (300) of determining per-cell traffic coverage in a cellular communication system according to any preceding Claim, wherein the steps of measuring and  
15      calculating are used in an automatic frequency planning operation of said cellular communication system.

9. The method (300) of determining per-cell traffic coverage in a cellular communication system according to  
20      any preceding Claim, wherein the wireless communication unit (146) receives measurement reports from a wireless serving communication unit, for example a base transceiver station (122-132), or a wireless subscriber communication unit (112-116).

25      10. A storage medium storing processor-implementable instructions for controlling a processor to carry out the method steps of any of claims 1 to 9.

30      11. A communication system (100) adapted to perform the steps of any of method Claims 1 to 9, the communication system (100) comprising an overlapping coverage calculation function (155).

12. A communication unit (146) for use in a cellular communication system that comprises multiple cells, the communication unit (146) comprising:

- a receiving function for receiving measurements
- 5. of one or more parameters relating to one or more operations of a first cell in said cellular communication system; and
- a processor, operably coupled to said receiving function, to process said received data,
- 10. the communication unit characterised in that said processor calculates a degree of coverage overlap based on a number of said measurements, wherein:
  - said processor partitions said received measurements into at least one of three categories with
  - 15. respect to the first cell, wherein:
    - (i) A first category indicates a wireless subscriber unit that is uniquely served by the first cell,
    - (ii) A second category where the measurement
  - 20. indicates a wireless subscriber unit that can be served by a number of cells, and
  - (iii) A third category where the measurement indicates a wireless subscriber unit that is served by a neighbouring cell but is located such that it could be
  - 25. served by the first cell.

13. The communication unit according to Claim 12, wherein said processor determines an unique coverage factor for a cell (UCF); where:

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$$\text{UCF} = \frac{\text{Sum of MRs with no and/or weak neighbours}}{\text{Total Sum of MRs}}$$

14. The communication unit according to any of preceding Claims 12 and 13, wherein said processor converts a number of measurements to Erlangs to determine a coverage overlap based on subscriber traffic within 5 said cell.
15. The communication unit according to Claim 14, wherein said processor allocates a priority, for example an alarm priority, to said cell based on said 10 calculation,
16. The communication unit according to any of preceding Claims 12 to 15, wherein said communication unit or a unit operably coupled to the communication unit 15 re-configures one or more operational parameters of said cell in response to said calculation.
17. The communication unit according to Claim 16, wherein said communication unit configures said cell for 20 transmit power changes, beam-forming antenna changes, and/or switching off said cell site.
18. The communication unit according to any of preceding Claims 12 to 17, wherein said communication 25 unit is an operations and management centre (146) configured to receive measurement report data relating to cells in said cellular communication system.
19. The communication unit according to any of 30 preceding Claims 12 to 18, wherein said measured data includes one or more of the following:

- (i) Cell statistical information, for example in the form of Congestion, Blocking, Mean-Hold Time (MHT), Handover (HO) Cause distribution information;
- 5 (ii) One or more Measurement Reports; or
- (iii) Control Signalling behaviour.

20. The communication unit according to any of preceding Claims 12 to 19, wherein said processor is operably coupled to a memory device for storing said 10 calculations for subsequent use in determining a cell outage strategy.

21. The communication unit according to any of preceding Claims 12 to 20, wherein said communication 15 unit is able to communicate on a GSM, GPRS, UMTS, iDEN, or CDMA cellular communication system.